MOBILE LEARNING IN HIGHER EDUCATION: MAPPING PERCEPTIONS AND PRACTICES OF ONLINE STUDENTS

G. Bastos, T. Cardoso, A. Quintas-Mendes, L. Amante

Universidade Aberta, LEAD (PORTUGAL)

Abstract

Mobile-learning is still an emergent field of research, especially if we consider the scope of higher education (HE). In fact, few studies have been developed with regard to higher education contexts, namely within Open Universities [1], [2], [3], [4]. Given the importance of studying mobility in real learning contexts, we aim at studying the perceptions that higher education students have about mobile and non-mobile devices and also how they describe their uses and practices in different types of interactions in online courses at a Distance Virtual University. In this context it was intended to know a) what are the students' perceptions about the affordances of various mobile and non-mobile devices, and b) what types of devices do students prefer to use in interactions with teachers, with other students and with contents. The data obtained in this study show that there is some discrepancy between students' perceptions of mobile devices, their educational potential and their actual use. The actual use of mobile devices seems to be much more conservative than we would be led to assume from the discourse of learning everywhere at any time with any device.

Keywords: Mobile learning, Higher Education, Perceptions, Practices, Online Students.

1 INTRODUCTION

The concept of the ecology of learning has imposed itself as a fundamental concept to situate ourselves today within the diversity of knowledge and the ways of accessing and building up this knowledge in contemporary societies. In his article "Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn", John Seely Brown uses Ecology as a metaphor to describe a learning environment. He states: "An ecology is basically an open, complex adaptive system comprising elements that are dynamic and interdependent. One of the things that makes an ecology so powerful and adaptable to new contexts is its diversity." [5]

Brown's concept of ecology points to the creation of learning environments that offer students a diversity and flexibility of choice, freedom of choice, easy, immediate and ubiquitous access. These environments should offer students learning opportunities through methods and models that best support their needs, interests and personal situation. It is in this context that mobile technologies have assumed particular importance in recent years.

As acknowledged by [6], “online teaching and mobile teaching have been the hot keywords in all educational institutions and will be the trend in the future.” On the other hand, “the potential and use of mobile devices in higher education has been a key issue for educational research and practice since the widespread adoption of these devices. Due to the evolving nature and affordances of mobile technologies, it is an area that requires ongoing investigation.” [3]

1.1 Mobile learning and pedagogical discourse

The pedagogical discourse about mobile technologies has been permeated by the idea that mobile learning promotes learning "anytime, everywhere" or that it also enables educational content anytime, anywhere on any device. Hypothetically, technological mobile devices would have specific "affordances" that would match perfectly with constructivist, connectivist and open pedagogical models of education. The term "affordance" originates from Gibson work on perception [7], in which he proposes that affordances are latent in the environment, objectively measurable and independent of the individual's ability to recognise them, but always related to the actor [8]. Donald Norman moved from Gibson`s supposedly objective "real affordances" to consider "perceived affordances", a conceptual shift that incorporates subjective interpretation and mental activity: "affordances reflect the possible relationships among actors and object" [9].

However, this suggestion of a simple causality between the possible characteristics of technological devices and their pedagogical use has caused some reservations on several authors [8, 10] who

assume that technologies, cognition and learning do not emerge in a social void and in a context-independent way. On the contrary, discursive practices and the real learning contexts where they occur need to be taken into account, allowing "technology to be described in a way that recognizes its social and historical production, as well as intentionality" [11].

Moreover, with regard to mobile learning, Laouris & Eteokleous [12] state that: "Not only should we not constrain our definition of mobile learning through mobiles, but we must shift focus from device to human. We suggest taking a broader view that accounts for a learner freely moving in his physical (and virtual) environment. Thus, Sharples, Taylor and Vavoula recognize that "it is the learner that is mobile, rather than the technology" [13].

Given the importance of studying mobility in real learning contexts, we aim at studying the perceptions that higher education students have about mobile and non-mobile devices and also how they describe their uses and practices in different types of interactions in online courses at a Distance Virtual University. In this context it was intended to know a) what are the students' perceptions about the affordances of various mobile and non-mobile devices, and b) what types of devices do students prefer to use in interactions with teachers, with other students and with contents.

2 MOBILE LEARNING AND STUDENTS' PERCEPTIONS

We have developed a survey, that was applied to a sample of 100 students of the Universidade Aberta (UAb, Portuguese Open University, Portugal). 98 answers were considered for the analysis: 78 women (78,79%) and 20 men (20,20%). Concerning age, table 1, shows the distribution.

Table 1: Age of participants in the survey.

Age Group	*Total nº*	*%*
18 to 24	0	0,00%
25 to 30	3	3,03%
31 to 35	8	8,08%
36 to 40	20	20,20%
41 to 50	46	46,46%
50 and more	21	21,21%

As we can see, most of the participants are adults with more than 36 years old that we consider mature students.

2.1 Study 1 - Students perceptions about different devices

In the first study it was intended to know what are the students' perceptions about the affordances of various mobile and non-mobile devices and also what are their opinions about the usefulness of mobile for learning devices.

2.1.1 Methodology and results

In study 1 we sought to examine students' perceptions of the 4 basic devices (Smartphone, Desktop, Tablet and Laptop) through a semantic differential. The semantic differential allows us to evaluate both the denotative dimension and the connotative dimension of a word, concept or object from scales that are organized around bipolar pairs of adjectives, allowing us to evaluate the affordances perceived by the students with regard to the different devices. We have used the semantic differentiators that O´Sullivan et al. have used to study the "mediated closeness" [14] as well as those used by Gunawardena to study the "social presence" [15]. Therefore, 18 scales with pairs of opposite adjectives with a 7-point scale were created, with a central point that corresponds to neutrality (0), and 3 points to the right of zero indicating increasing level of agreement and 3 points to the left indicating increasing level of disagreement. Figure 1 below illustrates a part of the semantic differential used in the survey.

Several computer devices are available in today's society. Please rate the following items in the scales below by checking a number, as shown in the example.

Mobile phone/Smartphone

Please select the number that best corresponds to each item:

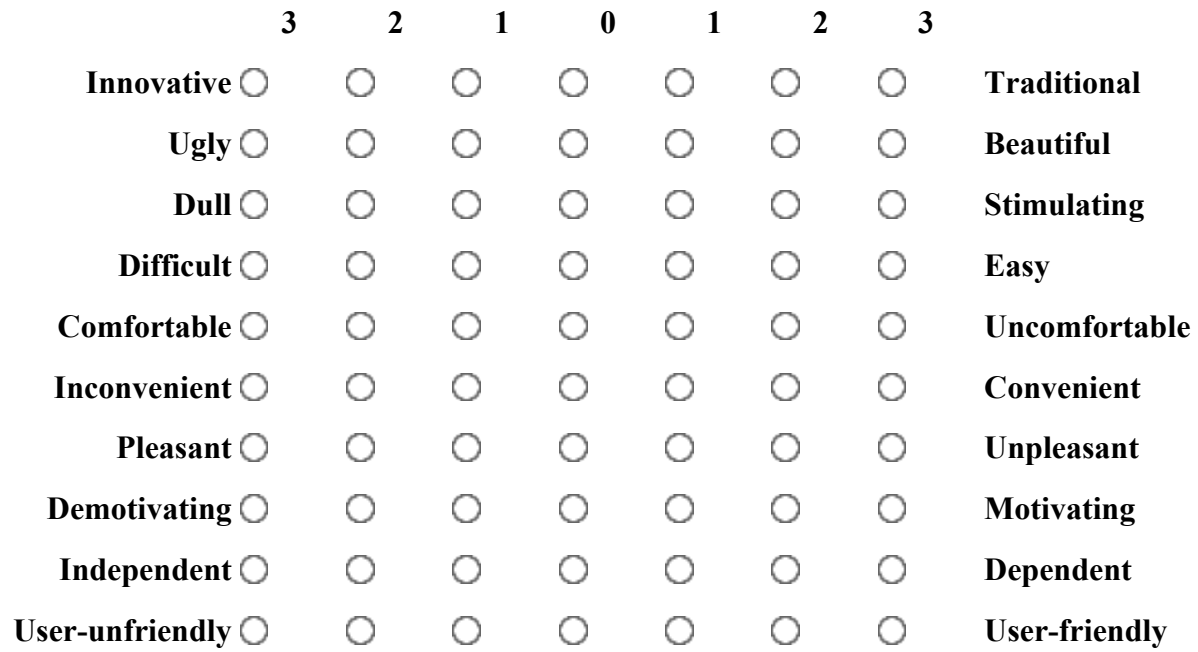

Figure 1. Example of a semantic differential

The results evidence that perceptions about smartphones differ in many ways from the perceptions about the desktop, namely the former appears clearly differentiated from the latter in dimensions such as Innovative/Traditional, Motivating/Demotivating, Appealing/Unappealing, Pleasant/Unpleasant, Independent / Dependent (see Table 2).

Table 2. Perceptions about digital devices through the semantic differential.

	Smartphone	*Desktop*	*Tablet*	*Laptop*
Innovative	94,34%	41,51%	83,01%	83,02%
Pleasant	88,68%	69,81%	71,70%	83,01%
Motivating	88,67%	69,81%	62,27%	79,24%
Independent	52,83%	22,64%	64,15%	58,49%
Appealing	77,35%	39,62%	52,83%	73,58%
Attractive	73,58%	58,49%	62,26%	71,70%
Inviting	81,13%	62,27%	66,03%	73,59%
Interactive	86,79%	60,38%	75,47%	75,47%
Active	69,81%	45,28%	56,61%	62,26%
Stimulating	79,25%	54,71%	56,60%	67,36%
Comfortable	77,35%	66,04%	56,61%	75,47%
Effective	90,57%	79,25%	75,47%	86,79%
Reliable	67,92%	69,81	62,26%	77,36%

The analysis of the data allows us to conclude that the smartphone, when compared to the desktop, is seen as more innovative, pleasant, motivating, independent, appealing, attractive, inviting, interactive and active and that the scores obtained by the tablet and laptop are generally more similar between themselves than to those obtained by the smartphone and the desktop.

In any case, it should be noted that in some dimensions the tablet appears with scores that are more similar to the desktop than to the other devices (eg, “Monotonous / Stimulant”; “Pleasant / Unpleasant”) and even compared to “Motivating / Demotivating” or “Comfortable / Uncomfortable” tablet scores appear to be less motivating and less comfortable than the desktop. The devices that get the most similar grades to each other are the smartphone and the laptop. In some dimensions (“Effective / Not Effective” and Reliable / Unreliable) devices do not appear to differ greatly from each other.

This data gives us an idea of how the various devices are perceived by students. But we still needed to understand to what extent mobile devices are perceived as technologies that facilitate the teaching-learning process. Table 3 shows the results obtained through a five point Likert scale in which students could express their opinion on the value of these mobile devices in the teaching-learning process.

Table 3. Adequacy of Mobile Devices in Teaching / Learning Contexts.

	Totally disagree	***Disagree***	***Neither agree not disagree***	***Agree***	***Totally agree***	
Itens						***Means***
I would like more mobile applications (apps) to be used in my course.	0,00	17,17	25,25	23,23	28,28	3,67
I think mobile applications (apps) motivate learning.	1,01	13,13	20,20	26,26	33,33	3,83
Mobile devices facilitate collaborative work with course/class colleagues.	5,05	5,05	3,03	26,26	54,55	4,28
Mobile devices facilitate interacting with the teacher.	4,04	7,07	12,12	24,24	46,46	4,09
Mobile devices facilitate interacting with study/learning contents	3,03	10,10	14,14	24,24	42,42	3,99
Mobile devices facilitate the production of learning contents	4,04	14,14	16,16	21,21	38,38	3,81
Mobile devices facilitate collaborative work with course/class colleagues.	3,03	5,05	13,13	27,27	45,45	4,14

The results show a generally positive attitude towards the use of mobile devices in the teaching-learning process and are considered particularly useful for student-student interaction (“facilitates interaction with colleagues” (M = 4.28); “facilitates collaborative work with peers ” (M = 4.09) and to a lesser extent it “facilitates interaction with the teacher” (M = 3.99) and with the content (“facilitates interaction with the content” (M = 3.99); “facilitates content production” (M = 3.81).

2.2 Study 2 - The use of multiple devices in virtual Learning Contexts

Once identified those main perceptions and attitudes towards digital devices and towards the use of these devices in teaching-learning contexts, it remains the question of knowing what are the students' actual uses of these devices in real teaching and learning contexts? This will be the problem addressed in this section.

2.2.1 Methodology and Results

To investigate the real uses of mobile and fixed devices by students, a part of the survey was developed using a Likert scale ranging from 1 to 5 in which: 1 - Never; 2 - Rarely; 3 - Sometimes; 4 - Frequently; 5 - Always.99 students answered to this part of the survey.

A first important question was to know where do students use either the fixed or the mobile devices. As we can see in table 4, students use the digital devices mainly at home and at the workplace. The use of digital devices in leisure spaces in transports or in other spaces is much less frequent.

Table 4. Places of use of fixed and mobile devices.

	At the workplace	*At home*	*In transports*	*In Leisure Spaces*	*Other Spaces*
Never	21,21%	2,02%	61,62%	42,42%	57,58%
Rarely	14,14%	0,00%	13,13%	27,27%	16,16%
Sometimes	27,27%	3,03%	13,13%	16,16%	16,16%
Frequently	20,20%	33,33%	7,07%	9,09%	7,07%
Always	16,16%	60,61%	4,04%	4,04%	2,02%

These results are relatively similar to those obtained in other studies [4], [13], [16]. The use of mobile and fixed devices at home stands out clearly from use in other contexts. It should be noted that it was pointed to the use of these devices in teaching learning contexts. Thus, we believe that we can say that for students to learn, they seem to prefer a more personal and perhaps more peaceful space.

Another important question is to know what students do with these digital devices.

Table 5. Types of uses of fixed and mobile devices (Means in a Likert scale of 5 points).

	Desktop	*Laptop*	*Tablet*	*Smartphone*
Using the Moodle Platform	3,78	4,39	2,18	2,76
Using Social Media in a Teaching-Learning Context	2,86	3,2	2,13	2,75
Scheduling Academic Tasks	3,33	3,76	2,14	3,09
Sending and Receiving Text Messages	3,15	3,43	2,16	3,74
Sending and Receiving e- mails	3,72	4,25	2,37	3,52
Participating in Web conferences (e.g. Skype)	2,56	4,25	2,37	3,52
Searching the Internet with academic purposes	3,88	4,46	2,34	2,88
Downloading and uploading files	3,78	4,31	2,00	2,39
Downloading and uploading files for reference/study	3,87	4,35	2,09	2,43
Writing texts	3,9	4,41	1,73	1,54
Participating in Discussion Forum	3,6	4,17	1,83	2,11

Regarding the types of use, although the results are scattered across the various devices, the preference for the laptop and the desktop emerges when it comes to activities with a clearly marked academic nature, especially research on the Internet, writing texts, using Moodle, downloading and uploading files.

The laptop has average values higher than 4 and the desktop values higher than 3 on a scale of 5. In almost all of these uses the smartphone and tablet are clearly neglected, especially the latter, even though the use of the smartphone exceeds that of the desktop when it comes to participating in web conferences and being the most widely used device for sending messages. Interestingly, the use of devices for access to social networks, in the context of teaching and learning, appears with the lowest average value of the set of activities presented, but still done preferably through the laptop, which stands out as the most used device.

3 DISCUSSION AND CONCLUSIONS

The data obtained in this study show that there is some discrepancy between students' perceptions of mobile devices, their educational potential and their actual use. The perceptions about mobile devices are extremely positive. Students see them as highly appealing devices on the one hand and with great potential for facilitating teaching and learning processes on the other. However, when it comes to markedly school-based academic activities, students clearly prefer stable spaces (home and work) and fixed devices (laptop and desktop). As pointed out by [17] in education today there is a strong tension between the current technological environment, characterized by speed, immediacy and ubiquity and the demands of the slower operating formal education systems, which require reflection

and call for a lengthy construction of knowledge. . We would thus say that, as Jackson [18] states, there is not just one ecology of learning but several. The ecology of formal education systems imposes habitus and forms of work which in some way restrain the idea of learning anytime, everywhere on any device..

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REFERENCES

[1] T. Cardoso and G. Bastos. “Mobile Learning in Higher Education: the case of Universidade Aberta (Portugal)”. In: *EDULEARN18 Proceedings*, 2018. 529-534. ISBN: 978-84-09-02709-5. https://doi.org/10.21125/edulearn.2018.0215

[2] T. Cardoso and R. Abreu, “Mobile Learning and Education: Synthesis of Open Access Research”. In Y. (A.) Zhang (Ed.). *Handbook of Mobile Teaching and Learning* (pp. 133-148). Springer Berlin Heidelberg, 2015.

[3] G. Krulland and J.M. Duart, “Research Trends in Mobile Learning in Higher Education: A Systematic Review of Articles (2011 – 2015)”. *International Review of Research in Open and Distance Learning*, vol. 18, no.7, 1-23, 2017.

[4] S. Cross, M. Sharples, G. Healing and J. Ellis, “Distance Learners’ Use of Handheld Technologies: Mobile Learning Activity, Changing Study Habits, and the ‘Place’ of Anywhere Learning”. *International Review of Research in Open and Distributed Learning*, vol. 20, no.2, 224–241, 2019.

[5] J. S. Brown, “Growing up digital: How the web changes work, education, and the ways people learn”. Change Magazine, March/April, pp. 11-20, 2000

[6] K. Greig and J.M Duart, “Supporting seamless learners: exploring patterns of multiple device use in an open and distance learning context”. *Research in Learning Technology*, vol. 27, 15-22, 2019.

[7] J.J. Gibson, The ecological approach to visual perception. Hillsdale, NJ: Lawrence Erlbaum, 1979.

[8] S. Wright and G. Parchomab, “Technologies for learning? An actor-network theory critique of ‘affordances’ in research on mobile learning”. Research in Learning Technology, vol. 19, no. 3, November, 247–258, 2011.

[9] D. A. Norman, The psychology of everyday things. New York: Basic Books, 1988.

[10] N. Selwyn, “Discourses of digital ‘disruption’ in education: a critical analysis”. Paper presented to Fifth International Roundtable on Discourse Analysis, City University, Hong Kong, May 23-25, 2013.

[11] M. Oliver, “The problem with affordance”. E-Learning, vol. 2, no. 4, 402–13, 2005.

[12] Y. Laouris and N. Eteokleous, We need an educationally relevant definition of mobile learning. Paper presented at mLearn 2005 , in Cape Town, South Africa.

[13] M. Sharples, J. Taylor and G. Vavoula, Towards a theory of mobile learning. Paper presented at mLearn 2005, October 25–28, in Cape Town, South Africa.

[14] P.B. O´Sullivan, S. Hunt and L. Lippert, “Mediated Immediacy: A Language of Affiliation in a Technological Age”. *Journal of Language and Social Psychology*, vol. 23, 464-490. Sage Publications, 2004.

[15] C. Gunawardena, “Social Presence Theory and Implications for Interaction and Collaborative Learning in Computer Conferences”, *IJET*, vol. 1, no. 2, 1995. Retrieved from https://www.learntechlib.org/primary/p/15156/

[16] G. Vavoula, D4.4: A study of mobile learning practices. *Report of MOBILearn project*, 2005. Retrieved from www.mobilearn.org/download/results/public_deliverables/MOBIlearn_D4.4_Final.pdf.

[17] G. Conole, New Schemas for Mapping Pedagogies and Technologies. *Ariadne*, vol. 56, 2008. Retrieved from http://www.ariadne.ac.uk/issue/56/conole/

[18] N. J. Jackson, “The Concept of Learning Ecologies”. In *Lifewide Learning, Education & Personal Development*, 2013. Retrieved from http://www.lifewideebook.co.uk/uploads/1/0/8/4/10842717/chapter_a5.pdf